

RECLAMATION

Managing Water in the West

Draft Environmental Assessment and Finding of No Significant Impact

Volta Wildlife Area Level 2 Diversification / Incremental Level 4 Development Pilot Project



U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

March 2010

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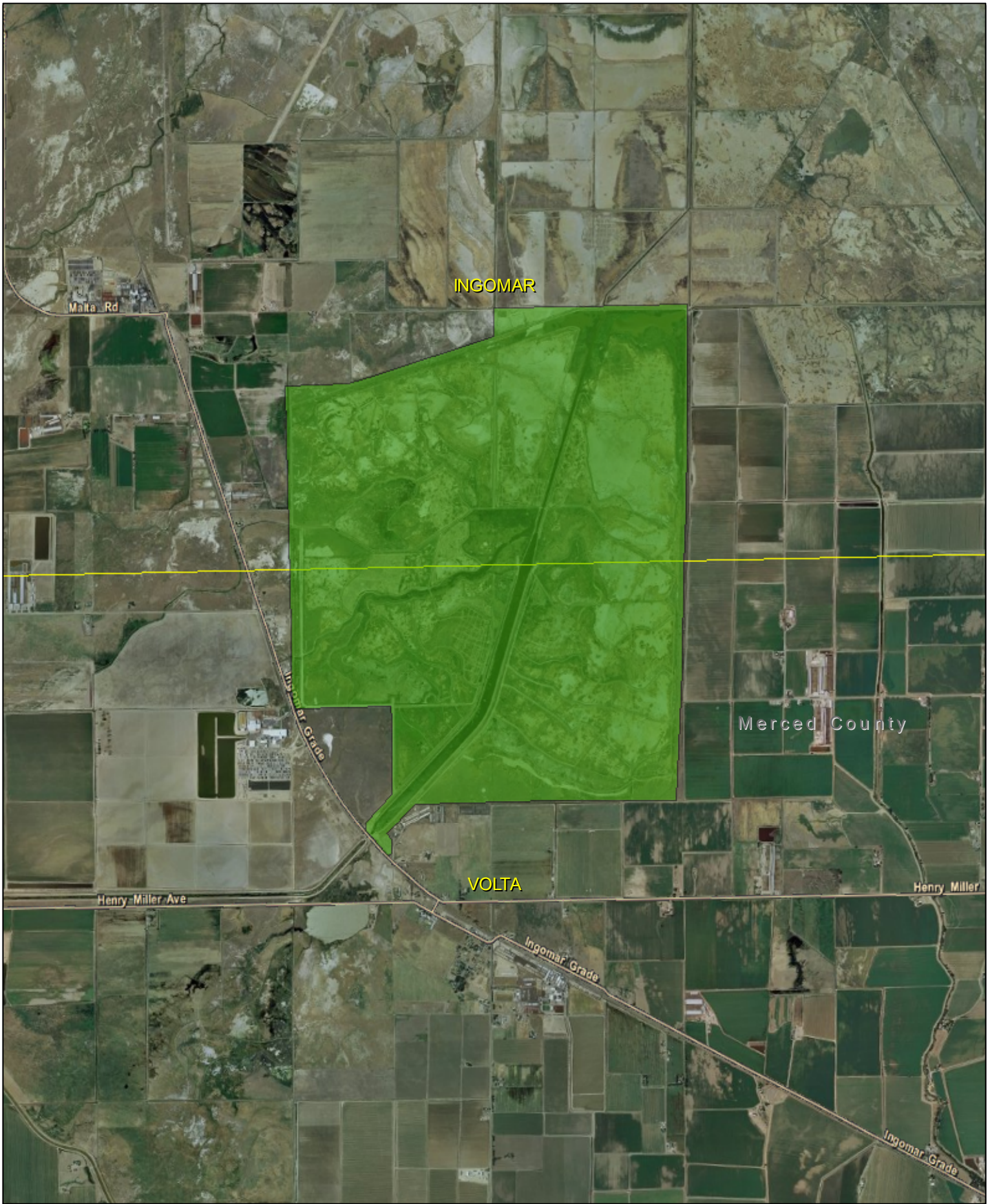
Section 1 Purpose and Need for Action


1.1 Introduction

Pursuant to the Central Valley Project Improvement Act of 1992 (CVPIA), Section 3406(d), the Secretary of the Interior, through the Bureau of Reclamation (Reclamation), is obligated to provide firm water supplies of suitable quality to 19 specific wetlands and wildlife habitat areas (refuges) in the California Central Valley.

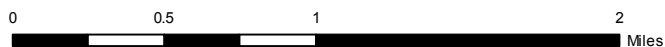
Annual refuge water allocations were established in the *Report on Refuge Water Supply Investigations* (3/1989) and the *San Joaquin Basin Action Plan/Kesterson Mitigation Plan* (12/1989), both reports incorporated into CVPIA by reference. Allocations are distinguished for two water types, Level 2 and Level 4. Level 2 Refuge Water Supplies refer to the historical annual average amount of water the refuges received between 1977 and 1984. Level 4 Refuge Water Supply is the annual amount of water needed for full development of the refuges based upon management goals developed in the 1980s. Incremental Level 4 is the difference between historic annual average water deliveries (Level 2) to refuges, and the refuge water supplies required to achieve optimum wetlands and wildlife habitat management (Level 4).

Section 3406(d)(2) requires that Reclamation provide full Level 4 supplies to all refuges starting in 2002. However, due to constraining issues including availability of water for Incremental Level 4 acquisition, funding and inadequate external conveyance capacity, Reclamation has not yet been able to meet that goal.



 7.5 Minute Quad Index

Volta Wildlife Area



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1.2 Purpose and Need

Water demands in the San Joaquin and Sacramento Valley continue to grow while developed supplies have not increased appreciably over the past several decades. Population growth and economic development in the region are resulting in both larger and firmer water demands. Changes in irrigated agricultural practices are increasing the demand for water. Additionally, there are important environmental water uses that need to be protected or expanded to sustain the Valley's rich and diverse natural habitats.

Reclamation is responsible for providing Level 2 and Incremental Level 4 water to 19 designated federal, state, and privately owned/managed wetlands and wildlife areas (refuges), including Volta Wildlife Area (VWA) and Grassland Resource Conservation District (GRCD). Level 2 water supplies are primarily provided from Central Valley Project (CVP) supplies. However, a small percentage of Level 2 supplies is met through other diverse sources including state water rights water and groundwater. Reclamation must acquire Incremental Level 4 water supplies through various means, including spot market purchases and groundwater development. Incremental Level 4 supplies are not provided from CVP yield. CVPIA Section 3406(d)(1) includes language to support diversification of Level 2 supplies and reads in part, "In implementing this paragraph, the Secretary shall endeavor to diversify sources of supply in order to minimize possible adverse effects upon Central Valley Project contractors."

Reclamation also provides CVP water supplies to agricultural and municipal contractors. Each year beginning in February the Reclamation Central Valley Operation Office (CVO) issues an allocation announcement for the available water quantities to all CVP contractors for the contract year, or water year, that begins in March. The CVO water allocation announcement is revised monthly through approximately May reflecting changing hydrologic conditions. The last three years (2007-2009) have been drought years resulting in reduced CVP surface storage supplies and availability to CVP contractors. Water years 2007 and 2008 were critically dry years and reservoir levels have been low in 2009. In addition, reservoir levels are expected to be low in 2010.

Essentially no new surface water supplies have been developed in the San Joaquin Valley for several decades. Since groundwater can be readily developed at most locations within the San Joaquin Valley, demands are being met primarily through development and use of groundwater by private landowners, irrigation and water districts, towns and cities, industries, and others.

Reclamation, San Luis Delta Mendota Water Authority (SLDMWA) and other CVP water service contractors, as well as refuge water supply contractors south of the Delta desire that Reclamation's Refuge Water Supply Program diversify sources of Level 2 water supplies, including the groundwater option. Amounts of Level 2 water provided from diverse sources results in increased CVP supplies available to other CVP water service contractors.

The purpose of the Proposed Action is to diversify a portion of existing Level 2 water supplies delivered to the VWA and GRCD which would free up CVP surface water made available for CVP agricultural contractors through the San Luis Delta-Mendota Water Authority (SLDMWA),

while specific refuge water supply needs/obligations are satisfied. The Proposed Action will also provide for development of additional Incremental Level 4 water supplies which will augment the limited pool of Incremental Level 4 water available to those refuges south of the Delta.

The ultimate goal of the proposed action is to develop a groundwater supply along the Volta Wasteway Channel (Wasteway) that can be used to diversify Level 2 refuge water supply sources and provide an additional source for Incremental Level 4 water supply, improve water supply reliability for CVP contractors, VWA and GRCD, and to confirm that the water quality is acceptable for refuge use. Reclamation's immediate objective is to produce up to 5,000 acre-feet of groundwater per year from this project. The analysis of water quality would occur through the implementation of a groundwater and surface water monitoring plan.

Section 2 Alternatives Including the Proposed Action

2.1 No Action

Under the no action alternative, Reclamation would not fund the installation of groundwater wells at the VWA. Furthermore, Reclamation would not pump groundwater at VWA in order to free up CVP surface water supply for SLDMWA. Groundwater would not be delivered via the Wasteway to GRCD to diversify Level 2 and supplement Incremental Level 4 refuge water needs. Opportunities to diversify water supplies through conjunctive management of groundwater and surface water would continue to be explored.

2.2 Proposed Action

Reclamation proposes to provide American Recovery and Reinvestment Act (ARRA) funding for the installation of two groundwater production wells and two monitoring well clusters. Reclamation proposes to diversify CVP Level 2 and supplement Incremental Level 4 refuge water supplies by pumping groundwater with the new wells. The diversification effort is being proposed as a three-year pilot project. This pilot project would plan for, design, and construct the needed facilities (June 2010 start), and then operate the wells and monitor well production, water quality, and water levels beginning September 2010 through February 2013. The pilot project would implement monitoring at the two locations to confirm that water quality is suitable for refuge use. Based on the data acquired a determination would be made to continue or cease the diversification operations at any time during the pilot project.

Initially, new production wells at VWA would pump groundwater 24 hours a day (anticipated production is up to 2,000 acre-feet) for approximately five months/year, beginning in September/October through January/February, of acceptable quality that can be conveyed and used within VWA and GRCD. In order to provide flexibility, Reclamation may decide to pump an additional volume of groundwater annually based on well efficiency, well productivity, and monitoring program data collected the first year of the pilot project. An increase would only occur if, after the first year of production (September 2010 through February 2011), the monitoring data demonstrates suitable water quality and water levels which would sustain additional pumping and would not result in significant impacts to any resources identified in this environmental assessment. In addition, a sufficient surface water flow must be available in the Wasteway for dilution, if dilution is necessary. If the above mentioned conditions exist, the duration and volume of groundwater pumped annually under the proposed action may increase to year round pumping of up to 5,000 acre-feet during the second and third year of the pilot project.

The total amount of groundwater pumped annually would be split 50/50 between Level 2 and Incremental Level 4 water supply in order to address CVPIA Section 3406(d)(1) diversification goal. The groundwater would be substituted in lieu of south of Delta Refuges receiving a portion their CVP Level 2 surface water supply. The accepted ratio for the in-lieu substitution is two acre-feet groundwater pumped would result in one acre-foot CVP surface water delivered to SLDMWA. .

The use of groundwater could ultimately free up to 2,500 acre-feet of CVP Level 2 surface water supply annually. The Level 2 CVP surface water freed up by groundwater substitution would be delivered to the SLDMWA. SLDMWA contractors would utilize the CVP surface water supply within their service areas for reasonable and beneficial use. The proposed action would diversify refuge water supply, improve water supply reliability, and minimize adverse impacts to CVP agricultural and municipal contractors.

Well-related construction activities which would occur as part of the proposed action include:

- Drill pilot borings to obtain information for the final design of the production and monitoring wells,
- Final design of the two production wells and five associated monitoring wells,
- Drill production wells and monitoring wells,
- Well testing to estimate the sustainable yield of the production wells, and
- Design and installation of the pump based on well testing results,
- Construction of the surface facilities, and
- Implementation of a three-year monitoring program

Well Design Approach

Well design would be in accordance with the American Water Works Association standards and the California Department of Water Resources for Well Standards, Bulletin 74-90 dated June 1991. A total target range of up to 2,000 acre-feet/year is the anticipated production rate for pumping occurring between September/October through January/February. The actual yield may be more or less, but would not exceed 5,000 acre-feet/year, and is dependent on aquifer conditions and changes to pumping durations.

Test-Production Well Construction

Reclamation plans to construct two- production wells. The construction window for the production wells is between May 1, 2010 and October 1, 2010. The entire construction window would not be necessary for well completion. If construction begins in May 1, 2010, it is anticipated that the production wells would be completed prior to June 2010. The production wells would produce groundwater from geologic units at depths ranging from approximately 500 to 900 feet below ground surface (bgs).

Well Locations

The two selected production well sites are located along the federal right-of-way abutting the Wasteway at a distance of approximately 2,000 feet apart. Well Site #1 is located just north of and adjacent to the Wasteway and Well Site #2 is located on the south side adjacent to the Wasteway as shown on the aerial map in Figure 2. Figure 3 is a closer aerial view of the VWA and the well locations. The approximate GPS coordinates of the two wells, +/- 25 feet, are:

- Well Site #1: 37° 06' 22.147" latitude and 120° 56' 10.001" longitude, and
- Well Site #2: 37° 06' 26.986" latitude and 120° 55' 52.897" longitude.

Access to the well sites would be by existing roads with short access road needed for Well Site #1. This short access road would be surfaced with gravel. A 30- to 40-foot gravel pad around

each production well site would be necessary for routine operation and maintenance activities. A 150-foot x 150-foot work area would be needed for actual drilling. Staging, drilling and installation are estimated to require three weeks on site (15 days @ 10 hours/day) for each production well.

The production wells would be drilled using a large truck-mounted reverse circulation mud rotary drilling rig equipped with a mud pump, pipe rack, and drilling fluid holding tank/shaker system. Steel casing would be used for the two production wells. Concrete pads would be constructed and the production wellheads would be configured to accommodate electrical service to the wellhead as well as the discharge piping.

The pumps may range from 8 to 12 inches in diameter. The pump may be a submersible or a vertical turbine. The pump size and type would be determined after well testing has occurred and aquifer conditions are known

Construction discharge piping is necessary for the conveyance of groundwater from the wellhead to the Wasteway. Well #1 requires 100 feet of 12 inch PVC pipe and a trench 3 feet deep to the edge of the Wasteway. Well #2 requires 300 feet of 12 inch PVC pipe laid in a trench 3 feet deep at the minimum and 12 feet deep at the maximum. The areas would be trenched using a backhoe, restored after pipe is laid and recovered with trenched material. Groundwater would be discharged in a manner to prevent bank disturbance. In order to dissipate the energy of the discharged water to a point that would not cause erosion, either a concrete discharge structure or a stainless steel structure would be utilized in conjunction with bank protection. The specifics for each well are:

- Well #1 and Well #2: The discharge pipeline would run perpendicular to the Wasteway from the wellhead. An underground pipe would convey the pumped groundwater to a concrete structure constructed on the Wasteway bank. The concrete or stainless steel structure would dissipate the energy to prevent erosion of the bank.

The width of the concrete or stainless steel structures outlet would depend on the well's yield. Once this is known, calculations would be made so that the discharge rate has a maximum velocity less than 3 feet per second.

The pilot boring would be drilled with a direct circulation mud rotary drill rig. In addition to the drill rig, the standard support equipment includes a drill stem trailer, compressor, and shaker unit to control the drill cuttings. A backhoe would likely be used to transport the drill cuttings from the production well site to a location to be determined in consultation with Reclamation and CDFG. During well construction, a larger reverse circulation drill rig would be used. In addition to the support equipment noted above, a transfer truck would be used to haul the gravel pack material to the well sites. The backhoe would also be used to dig a mud pit at each well site. The five monitoring wells would be installed with the direct circulation mud rotary drill rig to minimize land disturbance and costs.

The surface completions for each test-production well would consist of an 8-foot by 10-foot concrete pad and 20-inch discharge pipe. The wells would be located adjacent to the Wasteway.

The discharge pipes of the wells would be routed from the well sites to the Wasteway and discharge would be at the edge of the Wasteway. Drilling of test holes for monitoring wells and construction of production wells is scheduled to begin in May 2010 and be completed by June 2010.

Monitoring Wells

A well cluster with a pair of monitoring wells would be drilled near each production well site to monitor water levels during the aquifer tests as well as throughout the three-year pilot project. The monitoring well clusters would include a well screened above the Corcoran Clay and one screened below the Corcoran Clay. A third monitoring well would be installed in association with Well #1 to monitor water levels within 100-feet of the surface. The purpose of the deep monitoring wells would initially be to assist in estimating aquifer hydraulic parameters during the aquifer tests, and later to assist in evaluating the sustainable pumping rates of the production wells and to assess the degree of well interference. The purpose of the shallow wells is to document the degree of communication, if any, between the deep production wells and the shallow aquifer during pumping. PVC casing would be used for the monitoring wells. Concrete pads and locking steel monuments would be installed around the monitoring wells.

The approximate GPS coordinates of the monitoring well clusters are:

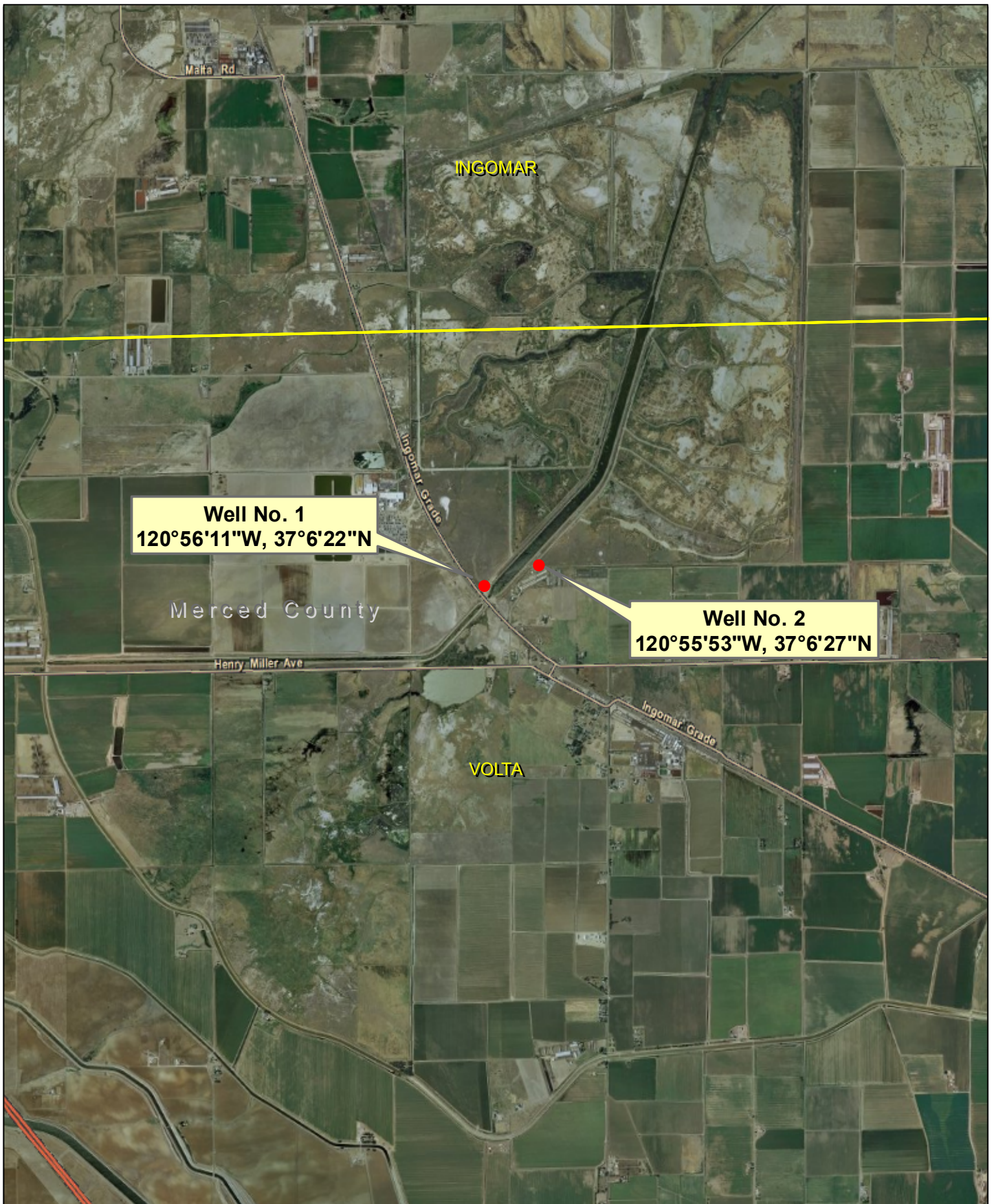
- Well #1: 37° 06' 20.221" Latitude, 120° 26' 10.8333" Longitude
- Well #2: 37 06' 28.521" Latitude, 120 55' 52.855" Longitude

Additional support vehicles including a water tender, front-end loader, pipe truck, and pickup trucks would be parked on-site. The drilling rig and associated equipment would occupy an area of approximately 150 feet by 150 feet. Access for these vehicles would be directly off the adjacent existing road for the Well #1 monitoring wells. No improvements for site access would be required for Well #1 monitoring wells. A 300 foot long access road would be constructed to allow access to the Well #2 Monitoring Wells. This access road would be of similar construction as other existing roads in the VWA. No off-site discharge of drill cuttings or fluids would occur. Drill cuttings and inert bentonite clay, produced during drilling operations, would be contained in an on-site settling pond and spread on site in an approved location upon well completion.

During the development phase, the water would initially be very turbid. The production wells would be sampled for the presence of selected constituents (e.g., Boron, Arsenic, Selenium, Mercury, Uranium) following well development and prior to performing the aquifer tests. The water quality results may factor into the management decision for the large volume of water to be discharged during the aquifer tests.

Following the completion of the aquifer tests and the estimation of the aquifer hydraulic parameters, well efficiency, and assessment of potential well interference, a recommendation would be made for the initial pumping rates. Based on water level measurements recorded during implementation of the groundwater monitoring plan, Reclamation would re-evaluate the originally selected pumping rates and revise original recommendations, if necessary, based on the monitored performance of the well.

More detailed information on the construction, testing and operation of the two production wells is located in the final specifications and drawings section 02520 C, D and F (Appendix A).



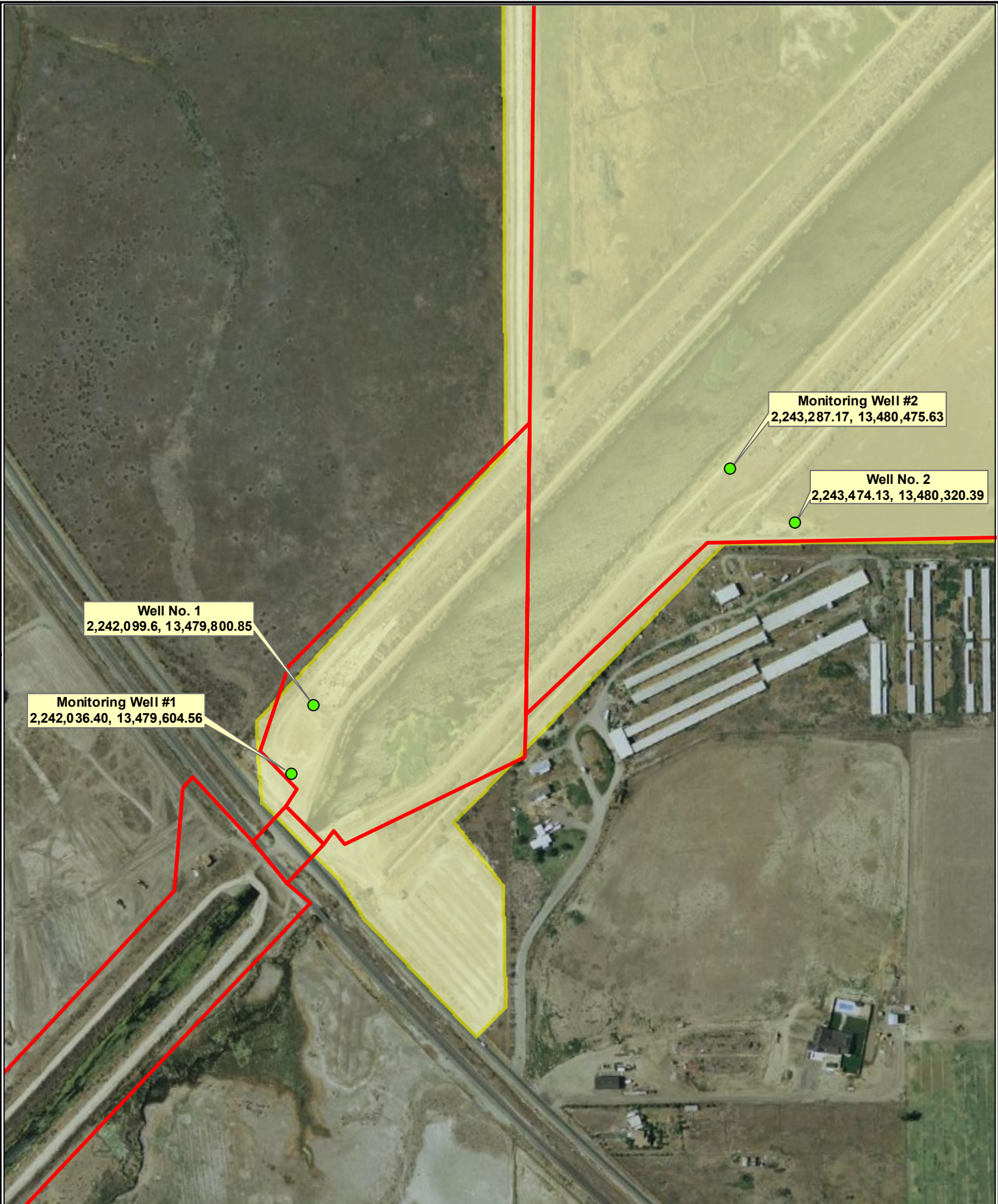
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Volta Quads with Wells



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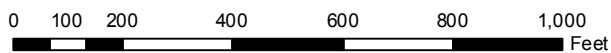


USBR Owned Lands



Volta Wildlife Area

Volta Wildlife Area



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Section 3 Affected Environment and Environmental Consequences

This section discusses the affected environment and environmental consequences of the Proposed Action. The overall study area includes specific analysis for each resource that may be directly or indirectly affected by water diversification methods.

Volta Wildlife Management Area

The 3,000-acre VWA area is located in western Merced County, approximately six miles east of the Santa Nella Water District and approximately seven miles northwest of the town of Los Banos. The area is situated on the north side of Ingomar grade and abuts the northwest portion of the Grassland Water District (GWD). The refuge lies within the GRCD, along its southwest boundary. The Wasteway is the primary supply canal for the Northern Division of the GRCD. Water is pumped from the Wasteway through a variety of control structures for distribution throughout the wildlife refuges in the area. (Figure 1)

The refuge maintains more than 1,800 acres of wetlands, including 1,400 acres of moist soil plants; 720 acres of alkali sink habitat are preserved on the refuge as a rare ecological community (USBR 1997a). The VWA provides habitat for a variety of bird species, including ducks, geese, shorebirds, coots, and wading birds. Black-necked stilts, sandpipers, dunlins, and dowitchers are the dominant shorebird species.

VWA has primarily been managed as a seasonally flooded wetland to provide the habitat needs of migratory waterfowl associated species. Approximately 1,970 acres of the area are managed as seasonally and semi-permanently flooded wetlands.

The VWA is owned by Reclamation and managed by the CDFG through lease agreement pursuant to the act of Congress approved June 17, 1902 (32 Stat. 388) and acts amendatory thereof or supplementary thereto, and the act of August 27, 1954 (68 Stat. 879), all collectively referred to as Federal Reclamation law. The lease agreement was initiated in 1952 and has been renegotiated several times since. The lease agreement obligates the CDFG to manage the 2,887 acre Wasteway and reservoir containing seasonal and semi-permanent wetlands as waterfowl habitat, and to provide public recreation.

San Luis Delta Mendota Water Authority

The San Luis & Delta-Mendota Water Authority was established in January of 1992 and consists of 32 Member Agencies representing approximately 2,100,000 acres of federal and exchange water service contractors within the western San Joaquin Valley from the City of Tracy in the north to Kettleman City in the south, as well as portions of Monterey, San Benito, Santa Cruz, and Santa Clara counties.

There are four unit/divisions within the SLDMWA. The San Luis Unit includes Westlands Water District (WD), San Luis WD, Panoche WD, and the Pacheco WD. The San Felipe Division includes San Benito County WD, Santa Clara Valley WD, and the Pajaro Valley Water Management Agency. Southern DMC Delta Division includes Fresno Slough Water District,

James Irrigation District (ID), Reclamation District 1606, Tranquillity ID, Widren WD, Oro Loma WD, Mercy Springs WD, Eagle Field WD, Laguna WD, Broadview WD, and the Coelho Family Trust. The Northern DMC-Delta Division includes Banta Carbona ID, Centinella WD, Del Puerto WD, Patterson ID, Byron Bethany ID, Westside ID, and West Stanislaus ID.

The Water Authority is responsible for delivery of approximately 3,000,000 acre-feet of water to the Member Agencies. The Delta-Mendota Canal (DMC) is the primary conveyance canal which delivers the water within the Authority service area. Of this amount, 2,500,000 acre-feet are delivered to highly productive agricultural lands, 150,000 to 200,000 acre-feet for municipal and industrial uses, and between 250,000 to 300,000 acre-feet are delivered to wildlife refuges for habitat enhancement and restoration.

The Westside region receives water pumped from the Delta by the Tracy Pumping Plant and conveyed via the DMC, by gravity, up to 116 miles to the Mendota Pool in the San Joaquin River. The Tracy Pumping Plant and the canal immediately downstream were designed to carry 4,600 cubic feet per second (cfs), but physical and institutional factors now limit that capacity. Water is further delivered to users at numerous turnouts. The O'Neill Pumping Plant, located at mile 70, can pump up to 4,200 cfs to storage in San Luis Reservoir. San Luis Reservoir withdrawals are conveyed south in the San Luis Canal, or west to Santa Clara and San Benito Counties (the San Felipe Division) via the Pacheco Tunnel and to CVP contractors on the lower DMC and Mendota Pool.

3.1 Surface Water Resources

3.1.1 Affected Environment

Volta Wildlife Area and Grassland Resource Conservation District

CVPIA Level 2 and Level 4 water is provided by Reclamation contract 01-WC-20-1756 signed January 19, 2001 to provide firm water supplies to State Wildlife Area's south of the Delta. The total amount of CVPIA Level 4 water allocated to VWA is 16,000 acre-feet per year (13,000 Level 2, and 3,000 Incremental Level 4). The contract also identifies 3,000 acre-feet/year of Level 4 "replacement" water which was provided to VWA prior to the CVPIA. The total amount of Level 4 water allocated to GRCD is 180,000 acre-feet (125,000 Level 2, and 55,000 Incremental Level 4). CVP Water is delivered to VWA from the San Luis Reservoir and O'Neill Forebay via the DMC and the Wasteway. The Wasteway enters VWA at the southwest corner and passes through the center. Surface water is lifted into two ditches by low lift pumps near Ingomar Grade Road. The ditches convey water to the eastern and western sections of the VWA. Water flows from the boundary ditches to the internal ditches by gravity. The ditch along the southern boundary contains runoff from an adjacent dairy. Water is also diverted from the Wasteway via outtake pipes located near a check dam in the center of the VWA. The refuge also often obtains water through special contracts to supplement the firm CVP supply. CVP refuge supply also flows through the Wasteway into Pond 10 at the northern end of VWA, from there it is delivered into GRCD for refuge purposes. This is one of the many delivery locations for the GRCD.

The CVP supply is adequate to meet Level 2 water supplies for VWA. In addition, in the 1999/2000 water service year, VWA was eligible to receive 70 percent of the incremental Level 4 which amounts to 4,200 acre-feet. VWA's agreement for 13,000 acre-feet fulfilled both the Refuge's Level 2 water supply (10,000 acre-feet) and much of the Level 4 increment. The full Level 4 water supply for VWA is 16,000 acre-feet.

San Luis Delta Mendota Water Authority

Water use in the CVP Westside region is dependent upon land use, which is characterized as agricultural, M&I, or habitat management. Agricultural water use occurs on approximately 850,000 irrigated acres on the Westside. The current M&I water supply provides a portion of the water supply needs for approximately two million people in Santa Clara and San Benito Counties as well as the San Joaquin Valley. Water use for habitat management occurs on approximately 120,000 acres of refuge lands.

The Westside region receives water pumped from the Delta by the Tracy Pumping Plant and conveyed via the Delta Mendota Canal (DMC), by gravity, up to 116 miles to the Mendota Pool in the San Joaquin River. The Tracy Pumping Plant and the canal immediately downstream were designed to carry 4,600 cfs, but physical and institutional factors now limit that capacity. Water is delivered to users at numerous turnouts. San Luis Reservoir withdrawals are conveyed south in the San Luis Canal, or west to Santa Clara and San Benito Counties (the San Felipe Division) via the Pacheco Tunnel and to CVP contractors on the lower DMC and Mendota Pool.

The Westside water supply is comprised of CVP water, groundwater, and local surface water. Since 1989, CVP water supply allocations have decreased significantly for Westside CVP contractors. Current water supply modeling efforts have shown that this decline is primarily attributable to implementation of the following laws and regulations:

- State Water Resources Control Board water quality standards for the Bay-Delta; Decision-1485 and Decision-1641.
- State and Federal Endangered Species Act provisions.
- Central Valley Project Improvement Act (P.L. 102-575) implementation. Prior to the State Water Resources Control Board adopting water quality standards, the listing of several species as either threatened or endangered, and the passage of the CVPIA, Westside agricultural contractors received 100% percent of their CVP contracted supply in almost every year since deliveries to the region began in June, 1951.

The only supply shortages experienced occurred as a result of severe drought conditions. Today, the long-term average allocation has been reduced to approximately 70 percent. The current M&I long-term average supply allocation has been reduced to approximately 90 percent under current conditions.

3.1.2 Environmental Consequences

No Action

Under the no action alternative, Reclamation would not provide funds under ARRA for the installation of two production wells along the Wasteway in the VWA. SLDMWA would not receive CVP surface water supply made available through groundwater substitution at VWA. Reclamation would look for other means to diversify refuge water supply.

Proposed Action

With ARRA funds from Reclamation, two groundwater wells would be installed at the VWA. The Refuge would then pump groundwater in-lieu of receiving a portion of their CVP supply. The accepted ratio is two acre-feet of groundwater: one acre-foot of CVP surface water. The CVP supply freed up by groundwater would be delivered to SLDMWA member units through their existing conveyance facilities and within the CVP place of use. SLDMWA would determine which member units receive the CVP supply. CVP surface water would continue to be delivered through the DMC and the Wasteway to VWA and GRCD. Although a reduction in surface water delivery to the Refuges would occur, twice as much groundwater being pumped would actually increase the amount of water delivery. There is, however, a small risk of increased seepage loss.

The Proposed Action would not impact surface water because a net increase or decrease in CVP surface water supplies being delivered south of the Delta would not occur. The total amount of CVP surface water delivered south of the Delta would remain the same; however, the ultimate location south of the Delta where the CVP surface water would be utilized would change. The change in location would not impact surface water resources, delivery of water to SLDMWA member units has been analyzed in. Surface water would be used for reasonable and beneficial use within SLDMWA. Furthermore, the proposed action is of limited duration (3 years), after which time a determination would be made to continue or cease the diversification project.

Cumulative Impacts

There are no adverse impacts to surface water resources which would result from implementation of the Proposed Action, therefore, the Proposed Action would not contribute to cumulative impacts to the resource.

3.2 Groundwater and Geologic Resources

3.2.1 Affected Environment

Volta Wildlife Area

Hydrologically, the VWA is located in the Merced sub-basin of the San Joaquin Valley Basin. Groundwater supplies are present in unconsolidated deposits extending to 900 feet or more below grade. An upper, semi-confined aquifer extends from approximately 50 to 250 feet below grade. The Corcoran Clay aquitard, provides a confining layer that is thick enough to separate the upper semi-confined aquifer from deeper alluvial deposits, which form the lower aquifer.

Groundwater has not been used on the refuge, and well infrastructure does not currently exist. Wells screened above the Corcoran Clay may be in hydraulic communication with overlying surface water features, such as refuge wetlands whereas wells screened in the lower aquifer are

not likely to affect surface waters. Due to the potential mixing of waters between the two aquifer units, the Merced County Environmental Health Department prohibits the construction of wells that are open to both aquifers within the same casing.

San Luis Delta Mendota Water Authority

The SLDMWA operates and provides services throughout the San Joaquin River hydrologic region (HR). The San Joaquin River HR covers approximately 9.7 million acres (15,200 square miles) and includes all of Calaveras, Tuolumne, Mariposa, Madera, San Joaquin, and Stanislaus counties, most of Merced and Amador counties, and parts of Alpine, Fresno, Alameda, Contra Costa, Sacramento, El Dorado and San Benito Counties. The region corresponds to a portion near the middle of Regional Water Quality Control Board (RWQCB) 5. Significant geographic features include the northern half of the San Joaquin Delta, the Sierra Nevada and Diablo Range. The region contains two entire groundwater basins and part of the San Joaquin Valley Groundwater Basin, which constitutes south into the Tulare Lake HR. The San Joaquin Valley Groundwater Basin is divided into nine sub basins in this region. The basin underlies 3.73 million acres (5,830 square miles) or about 38 percent of the entire HR area.

The development of the west side of the San Joaquin Valley for irrigated agriculture and the advent of deep-well turbine pumps in the 1920s drastically changed the groundwater flow system. Groundwater became an important component of irrigation water and, responding to the post-World War II boom in the economy, groundwater pumping increased by a factor of four, reaching a maximum of about a million acre-feet per year between 1950 and 1970. Most of this pumping was from the confined aquifer below the Corcoran Clay. Water tables dropped and there was pervasive land subsidence on the west side. This led to an increase in the cost of pumping and a call for a reduction in the volume of groundwater pumped on an annual basis. This led to the construction of the CVP and SWP conveyance facilities and the importation of surface water from the Delta..

Irrigated agriculture has been practiced on the west-side of the San Joaquin Valley for over a century. Irrigation activities of surface recharge and groundwater withdrawal have modified the pre-existing groundwater flow patterns, especially recharge-area and discharge-area relationships. Application of irrigation water causes water tables to rise in the shallow semi-confined aquifer, leading to an increase in the vertically downward movement of water. Because of the large areal extent of applied irrigation water on the west side, the resulting artificial recharge has significantly exceeded natural groundwater recharge by rainfall and stream flows.

The region is heavily groundwater reliant. Within the region, groundwater accounts for about 30 percent of the annual supply used for agricultural and urban purposes. Groundwater use in the region accounts for about 18 percent of statewide groundwater use for agricultural and urban needs. Groundwater use in the region accounts for 5 percent of the State's overall supply from all sources for agricultural and urban uses (DWR 1998).

Groundwater wells commonly extend to depths of up to 800 feet. Aquifers include unconsolidated alluvium and consolidated rocks with unconfined and confined groundwater conditions. Typical well yields in the San Joaquin Valley range from 300 to 2,000 gallons per minute (gpm) with yields of 5,000 gpm possible. The region's only significant basin located

outside the San Joaquin Valley is Yosemite Valley. The Yosemite Valley Basin supplies water to Yosemite National Park and groundwater wells in the basin have substantial well yields.

In addition to reduced CVP supply allocations, groundwater supplies in the region are declining due to a long-term overdraft condition caused by over-pumping. To protect the long-term sustainability of this resource, groundwater pumping has been significantly reduced, especially when compared to historic use. This, however, has further reduced available water supplies in the region.

Inelastic Land Subsidence

Land subsidence due to groundwater withdrawal is triggered by decreases in pore pressure in a confined aquifer system containing clay layers (typically, montmorillonite, or kaolinite clay). The decrease in pore pressure increases the effective stress on the aquifer skeleton. If this effective stress exceeds the maximum stress to which the aquifer skeleton has been subjected in the past, the clay layers can undergo permanent compaction.

Elastic subsidence occurs in response to seasonal changes in pore pressure within the aquifer system. Elastic subsidence is a characteristic of any confined aquifer system and does not result in permanent compaction. (USGS 2009)

3.2.2 Environmental Consequences

No Action

Under the no action alternative, groundwater development would not occur at VWA. Reclamation would not provide ARRA funds for the proposed action and production wells would not be installed at VWA. Groundwater use would continue as it presently does within SLDMWA.

Proposed Action

Under the proposed action, groundwater would be produced from below the Corcoran Clay for use within VWA and GRCD. Following the installation of two new production wells at VWA, groundwater would be pumped in an amount up to 2,000 acre-feet between September/October and January/February (four to five months) each year during the pilot project. This five month period coincides with the highest demand period for refuge water supply and would ensure blending with surface water would be maximized. The actual amount of groundwater produced would be dependent on the productivity of the wells and other factors, such as water quality, groundwater drawdown, and impacts to other users. All groundwater produced by the production wells would be discharged into the Wasteway and mixed with surface water for dilution (if necessary). All groundwater produced during the pilot project would be used for refuge management purposes at VWA and GRCD.

Additional pumping may only occur after the first year of the pilot project if monitoring data indicates water quality and water levels are suitable for refuge use. If the additional pumping occurs, it would continue year round as needed, and total production would increase “up to 5,000

acre-feet per year” during years 2011-2013. Surface water flows must be available in the Wasteway to meet dilution requirements, if necessary

Since VWA does not currently utilize groundwater, the installation of the production wells and their operation during the pilot period would cause a slight increase in groundwater use in the area. Current groundwater withdrawal is zero in the VWA. The total amount of groundwater which could be pumped during the three-year pilot period would be up to 12,000 acre feet.

Increased use of groundwater in Merced County could potentially affect groundwater levels, water quality, surface water/groundwater interactions, and rates of inelastic land subsidence. These types of potential impacts are not anticipated to occur beyond the VWA. Although an increase in groundwater extraction would occur, the amount is minimal when compared to the groundwater use in the San Joaquin River HR. Average groundwater usage in the region accounts for about 30 percent of the annual supply used for agricultural and urban purposes (DWR, 2003). Average pumping from beneath the Corcoran Clay in the general area of VWA is minimal. There are local landowner wells in the vicinity of VWA, as well as production wells in operation at two tomato processing plants. These plants are located within a two mile radius of the VWA proposed well locations. Under the proposed action, 2,000 acre-feet to 5,000 acre-feet per year would be a minimal increase to the average regional groundwater use. If monitoring indicates a significant decline in groundwater levels in the relevant vicinity of the test pumps, and that any such decline is not directly attributable to a cause other than the proposed action, then the test pumping would be modified or terminated as necessary to avoid any significant adverse impacts.

One of the generally unrecognized limitations in groundwater availability is subsidence from groundwater withdrawal. If pumpage demands are large enough, subsidence can occur. In the San Joaquin Valley, land subsidence has resulted in damage to buildings, aqueducts, well casings, bridges, and highways and has caused flooding. These damages have cost millions of dollars (USGS 2009). Subsidence is unlikely to occur as a result of the Proposed Action. Although pumping would occur from beneath the Corcoran Clay, the total volume of groundwater produced is minimal when compared to regional groundwater pumping in the San Joaquin Valley. Most groundwater production in the San Joaquin Valley occurs above the Corcoran Clay. In addition, there would be sufficient recharge during non-pumping periods which would offset any decreases in pore pressure caused by the Proposed Action. Reclamation has an interagency agreement with the United States Geologic Survey (USGS) to monitor subsidence along the Delta Mendota Canal. The study, “*Evaluation of Groundwater Conditions and Land Subsidence along the Delta Mendota Canal*” would incorporate VWA groundwater production as a factor in analyzing subsidence.

Table 1. Estimated Groundwater Pumping Durations, Rates and Volumes by Test Phase per Test-Production Well

Test Phase	Approximate Pumping Duration (days)	Assumed Average Pumping Rate (gallons per minute)	Estimated Groundwater Volume (af)/well	Total Groundwater Volume (af) - based on 2 wells
Well Development	5 days (50 hours)	1,000	9.2	18.4
1 – Step Test	1 day (6hours)	1,500	1.66	3.31
2 – Constant Rate Test	5 days (120 hours)	1,500	33.14	66.3
3 – Operational Test	*450 days	1,500	2,985	5,970
		Total =	3,029	6,058

*Based on 5 months at 30 days/month for 3 years total time. This operational time period may be extended to other times during the year (only after the first year); the total groundwater production would not exceed 5,000 acre-feet/year.

Cumulative Effects

When added to past, present, and future foreseeable action, the proposed action would contribute a minor increase in groundwater production in the general vicinity for three years. Private wells and local municipalities in and near the study area would continue to utilize groundwater during the proposed action. Most of the private and local wells would be pumping from water bearing strata above the Corcoran Clay, not at the same depths as the proposed wells in VWA. It is not anticipated that pumping during the proposed action would impact the upper aquifer system.

Although most wells in the general area pump from water bearing strata above the Corcoran clay, two tomato packing plants pump groundwater from below the Corcoran Clay, Ingomar Packing Company and Morning Star Packing Company.

Facility 1 – Ingomar Packing Company. The facility and production wells are located at 9950 S. Ingomar Grade, Los Banos, CA. The Ingomar facility is approximately three miles north of the proposed locations for the VWA production wells. Ingomar operates five wells during the packing season (July – October), typically 100 days. The wells range in depth from 195 feet below ground surface (bgs) to 620 feet bgs. Water level data is not collected from the wells. The water quality data in Table 2 was collected between 2003 and 2008. Three wells, wells #1, #2, and #3 pump from beneath the Corcoran Clay. Assuming operation occurs for 24 hours for 100 days, the production for wells #1, #2, and #3 would be 24.4 acre-feet/day or 2,440 acre-feet/100 days at a maximum.

Table 2 Ingomar Well Information

INGOMAR PACKING COMPANY WATER PRODUCTION WELL INFORMATION								
WELL	TOTAL	PUMPING	Average	BOWL		EC	TDS	PH
#	WELL DEPTH FEET	RATE GPM	Pump Time Days	SETTING FEET	Screen	Min/Max	Min/Max	Min/Max
#1	620	1650	100	240	Cone Length 10'	1400/2500	810/1500	8.0/8.2
#2	600	1975	100	240	Cone Length 10'	1300/2100	760/1200	8.1/8.2
#3	500	1990	100	270	Cone Length 10'	1000/3400	570/2000	7.8/8.1
#4	195	400	100	160	Cone Length 10'	1200/1400	710/880	8.0/8.1
#6	219	870	100	200	Cone Length 10'	940/4800	540/5800	7.9/8.2
			Days					

Facility 2 – Morning Star Packing Company. The facility’s closest production wells are located at 13448 Volta Road, Los Banos, CA. This facility is approximately $\frac{3}{4}$ miles south of the proposed locations for the VWA production wells. Currently, Morning Star operates their wells only during the packing season (July – October). They do not collect water level data from the wells. Reclamation is unable to gather specific information on this pumping plant. However, Reclamation assumes that production at Morning Star is similar to that of Ingomar.

The incremental impact of pumping up to 5,000 acre-feet/year under the Proposed Action when added to the pumping that occurs at the packaging plants, would contribute a minimal increase to groundwater pumping from below the Corcoran Clay during the 3 year pilot project. This cumulative impact would not be substantial because groundwater levels would be monitored for drawdown to avoid adverse impacts. In addition, some overlap in production time may result from simultaneous pumping at VWA and the packing plants between September and October. However, the time period would be short (2 months) and the additional pumping of the VWA wells would only contribute up to 6.63 acre-feet/day maximum for the two month period (60 days max). This additional amount of pumping would not substantially impact groundwater resources.

3.3 Water Quality

3.3.1 Affected Environment

Volta Wildlife Management Area

The groundwater quality within the Merced sub-basin varies with location and depth both within the upper aquifer above the Corcoran Clay and in the lower aquifer beneath the Corcoran Clay. Total dissolved solids (TDS) concentrations generally range from 100 to 3,600 milligrams per

liter (mg/L). In two test holes drilled in the VWA, TDS range from 300 to over 1,500 mg/L. Based on this limited data, and discussions with local drillers familiar with the area, the water quality of the deep aquifer is highly variable. Elevated mineral or other constituents (e.g. Arsenic, Selenium, or Boron) may require that the groundwater be diluted or mixed with surface water to comply with Total Maximum Daily Load (TMDL) regulations and/or refuge water quality requirements.

Good water quality might be in the range of 1,000 - 2,500 micro-siemens (uS)/cm electrical conductivity (EC) and 700 - 1,700 mg/l TDS. Typically groundwater quality above 3,000 uS/cm can be used only after blending with better quality water supply. Reconnaissance test wells that were drilled close to the current site of Well 1 and approximately 1/2 mile east of the VWA gate revealed water of good quality sub-Corcoran at the first test well. Water at the second test well was of poorer quality and unsuitable for direct use within the VWA. . Production wells approximately one mile to the northwest and one mile to the southwest of the current Well 1 site also report water of good quality. These wells are actively pumping groundwater for use in the processing plants situated along Ingomar Grade. From this information it can be surmised that sub-Corcoran aquifer water quality generally improves as one moves west from the Ingomar Grade alignment. Wells drilled close to the alignment of the Wasteway might also benefit from slow recharge of good quality surface water from the Wasteway itself. Although these rates of recharge are likely very slow, over time these cross-Corcoran fluxes could help to improve water quality. Recharge to the aquifer beneath the Corcoran Clay is from the west.

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Water quality is highly variable within the service area of the SLDMWA. In general water deteriorates in water from west to east – with the poorest water quality in the trough of the Valley. In the Valley trough the presence of A and C clay lenses impede drainage and vertical flow – allowing more refluxing of shallow groundwater before it moves deeper into the lower semi-confined aquifer. Evidence of the suitability of groundwater for conjunctive use purposes can be found by observation of the number of groundwater wells in the SLDMWA service area. Production wells tend to be clustered in areas of good well yield and suitable water quality. The Central California Irrigation District (a 110,000 acre Irrigation District within the SLDMWA) operates several dozen district owned wells – these are mostly screened above the Corcoran Clay and located throughout the District west of the Valley trough.

3.3.2 Environmental Consequences

No Action

Under the No Action alternative, groundwater development would not occur at VWA. Reclamation would not fund the pilot project and production wells would not be installed at VWA. CVP surface water would not be delivered to SLDMWA. Groundwater use would continue as it presently does within SLDMWA.

Proposed Action

Monitoring data from the Ingomar Packaging Company indicates a range of water quality measurements. Groundwater quality data are necessary for the protection of groundwater

resources because deterioration of groundwater quality may be irreversible, and treatment of contaminated groundwater can be expensive. Water quality impacts that could occur to surface water by pumping groundwater of poor quality and discharging it into the Wasteway are minimal. This type of impact is unlikely to occur since the ratio of surface water moving through the Wasteway would be greater than the amount groundwater that is pumped into the Wasteway. Sub-Corcoran groundwater is assumed to be of suitable quality for refuge use. If necessary, surface water in the Wasteway would be used to dilute the groundwater to a suitable level for further delivery to VWA and GRCD. Dilution of groundwater with surface water is a common practice. Furthermore, based on monitoring data from Ingomar, it appears that the EC readings indicate suitable water quality, except for Well #3's maximum EC measurement.

Various water-management actions potentially have groundwater-quality effects. Therefore, water quality needs to be considered in conjunction with information about changes in water levels and water in storage in evaluating the availability and sustainability of groundwater. The Proposed Action would implement a water quality monitoring plan to ensure that water quality standards for selenium and boron are not exceeded. If water quality monitoring indicates unsuitable water quality levels, pumping operation would cease. The Project Monitoring Plan is included in Appendix B.

The potential for poor water quality to be extracted under the Proposed Action exists, however, the Project Monitoring Plan (Appendix B) would avoid or mitigate for unsuitable water quality to ensure that no adverse impacts occur to water supply during the pilot project.

Cumulative Impacts

Under the Proposed Action, impacts to water quality would not occur since continual monitoring would occur along with any follow-on mitigation. Therefore, the Proposed Action would not contribute to cumulative impacts to water quality.

3.4 Land Use

3.4.1 Affected Environment

Volta Wildlife Area

The VWA has primarily been managed as a seasonally flooded wetland to provide the habitat needs of migratory waterfowl and associated species. Approximately 1,970 acres of the area are managed as seasonally and semi-permanently flooded wetlands. In recent years research has indicated there can be positive benefits to wildlife by maintaining some of this seasonally flooded wetland during seasons other than fall and winter. Management at VWA has begun to evolve to reflect this new management paradigm. These flooded areas need not be large to be effective habitat components. Also by carefully managing depth, location, and topography, normal habitat manipulations can still be accommodated in the major portion of each cell, while one or more edges remain flooded.

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Land use in SLDMWA is characterized as agricultural, M&I, or habitat management. Agriculture is the predominant land use occurring on approximately 850,000 irrigated acres on

the Westside. The current M&I water supply provides a portion of the water supply needs for approximately two million people in Santa Clara and San Benito Counties as well as the San Joaquin Valley. Land use for habitat management occurs on approximately 120,000 acres of refuge lands

3.4.2 Environmental Consequences

No Action

Under the No Action alternative, groundwater development would not occur at VWA. Reclamation would not fund the pilot project and production wells would not be installed at VWA. Ongoing land use would continue in VWA and SLDMWA.

Proposed Action

Under the Proposed Action alternative, construction of each test-production well would occur within an area of approximately 150-feet by 150-feet and the completed production well facilities would occupy a smaller area within the construction zone.

The total land area affected by production well construction is minimal when compared to the total area (3,000 acres) in VWA. Changes in land use would not occur as a result of the proposed action in VWA, SLDMWA or GRCD. Therefore, the Proposed Action would not impact existing land use.

Cumulative Impacts

Since the Proposed Action would not impact existing land use, it would not contribute to cumulative impacts on land use.

3.5 Air Quality

3.5.1 Affected Environment

Volta Wildlife Area

Merced County falls within the San Joaquin Valley Air Pollution Control District. Merced County's air quality emissions exceed Federal/State ozone standards and State PM10 standards. This is a result of the topography and climate creating inversion layers and the high volumes of air pollutant emissions from Merced County's major sources: automobiles, confined animal facilities, on and off-road vehicles, and other industrial activities. The air quality attainment status for Merced County is summarized in Table 3.

Table 3. Status of Air Quality Attainment for Merced County (Source: California Air Resources Board 2006),

County	Air Pollutant		
	Ozone State and Federal	PM10 State/Federal	Carbon Monoxide
Merced	Non-attainment	Non-attainment/Attainment	Unclassified

3.5.2 Environmental Consequences

No Action

Under the No Action alternative, there would be no change to existing air quality conditions, regulation, or attainment of standards.

Proposed Action

Under the Proposed Action, there would be temporary effects on air quality due to emission of air pollutants from diesel powered equipment during the period of construction. Average fuel use rate is approximately 25gallons/hour. Based on that the following assumptions have been made:

Production wells

1. Rig time estimate is 10 hours/day
2. Production Wells would require rig use for drilling, reaming, construction and development of the wells. Total hours of operation for one production well= 25 days, (250 hours)=6,250 gallons of fuel.
3. Total fuel for two production wells =12,500 gallons

Monitoring Wells

1. Rig time estimate is 15 gallons per hour use for 10 hours/day
2. Monitoring wells would require rig use for drilling, construction and development of the wells. Total hours of operation for five monitoring wells =18 days=180 hours=2,700 gallons of fuel.

Aquifer Testing

1. Diesel generator estimate burning 15 gallons/hour
2. Two constant rate tests=120 hours/test.
3. Total hours of operation=260 hours=3,900 gallons.

Prior to project construction, the contractor would be responsible for obtaining permits, if required, from the San Joaquin Valley Air Pollution Control District. Combined, there is an estimated 550 hours of equipment operation required for the construction of the proposed wells. Total fuel consumption during well construction is estimated to be 19,100 gallons. There would be temporary emissions (impacts) resulting from the use of the construction equipment. The wells are electric and would not contribute impacts to air quality.

Cumulative Impacts

Although there are temporary impacts to air quality as a result of the Proposed Action, the magnitude of those impacts would not contribute to long term, cumulative impacts on air quality. The air quality impacts associated with the construction of the two wells would be temporary and would not continue for the three year pilot project, therefore, a small impact may occur during construction.

3.6 Biological Resources

3.6.1 Affected Environment

Volta Wildlife Area and Grassland Resource Conservation District

Wetland

The wetlands of VWA are maintained by surface irrigation water and a water conveyance infrastructure is in place to service each of the numerous ponds or cells. Three low lift pumps, installed and owned by the California Department of Fish and Game, are located on the Volta Wasteway at Ingomar Grade and facilitate water conveyance to the higher elevations of the wildlife area and to irrigate feed or cover plantings. Vernal pools or seasonal wetlands occur within the VWA. A search of the California Natural Diversity Database indicated presence of wetlands within the USGS 7.5 minute quadrangles of Ingomar (403B) and Volta (403C). These quadrangles encompass the well locations identified in the Proposed Action area (Appendix C).

In VWA and GRCD, wetland habitats consist of seasonally flooded marshes, including moist soil impoundments, and permanent ponds/summer water.

Seasonally flooded marsh is by far the most numerous and diverse of the wetland habitat types on the state and federal refuges and private wetland areas of the San Joaquin River Basin. Seasonal wetlands are inundated fields or ponds that are managed primarily to grow seed and to produce invertebrates for migratory waterfowl, shorebirds and other wetland-dependent wildlife. These wetlands are usually flooded from October through March, and are dry for the rest of the year except for summer irrigation.

The diversity of seasonal wetlands is the product of a variety of water depths that result in an array of vegetative species that, in combination, provide habitat for the greatest number of wildlife species throughout the course of a year. Through the fall and winter, seasonally flooded marshes are used by large concentrations of waterfowl and smaller numbers of egrets, herons, ibis, and grebes, to name a few. In addition, a full complement of raptors take advantage of the water bird prey base. Water is removed in the spring, so large concentrations of shorebirds use the shallow depth and exposed mudflats on the northern migration. Seed-producing plants germinate and grow to maturity on the moist pond bottoms during the springs and early summer. Wetland flooding in the fall makes this food available to early migrant waterfowl and other waterfowl.

Moist soil impoundments are similar to seasonally flooded marshes, except that they are irrigated in the summer to improve production of water grass, sprangletop, and swamp timothy, the primary food species for waterfowl. Moist soil impoundments are typically irrigated during the summer to bolster plant growth and to enhance seed production. During irrigation periods, these units are often used by locally nesting colonial water birds (egrets, herons). Once flooded, these units provide an abundant food source for waterfowl. In addition, a number of wading bird species frequent them throughout the year.

Semi-permanent/permanent wetlands provide wetland habitat for year-round and summer resident species. Semi-permanent wetlands are flooded for 8 or months of the year, while permanent wetlands remain flooded throughout the year. Characterized by both emergent and submergent aquatic plants, semi-permanent/permanent wetlands provide brood and molting areas for waterfowl, secure roosting and nesting sites for wading birds and other over-water nesters, and provide feeding areas for species like cormorants and pelicans.

Riparian

There are no riparian habitats that occur in the proposed construction action area or near the water delivery areas.

Developed/Disturbed

Developed and disturbed areas include major roads, highways, and buildings and structures within more urban areas, but also facilities and access roads which are located throughout the VWA near each proposed well location.

Wildlife

The following list was obtained on July 20, 2009 by accessing the U.S. Fish and Wildlife database at http://www.fws.gov/sacramento/es/spp_list.htm. The list was regenerated October 26, 2009. This list is for the following 7 ½- minute U.S. Geological Survey quadrangles: INGOMAR (403B) Listed Species and VOLTA (403C) Listed Species.

Table 4 Federally Listed, Proposed & Candidate Species and Migratory Birds Potentially Occurring In Proposed Action Area

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS
INVERTEBRATES		
<i>Branchinecta longiantenna</i>	Longhorn fairy shrimp	Endangered
<i>Lepidurus packardii</i>	Vernal pool tadpole shrimp	Endangered
<i>Branchinecta lynchi</i>	Vernal pool fairy shrimp	Threatened
<i>Desmocerus californicus dimorphus</i>	Valley elderberry longhorn beetle	Threatened
FISH		
<i>Hypomesus transpacificus</i>	Delta smelt	Threatened
<i>Oncorhynchus mykiss</i>	Central Valley Steelhead	Threatened (NMFS)
AMPHIBIANS		
<i>Ambystoma californiense</i>	California tiger salamander, central population	Threatened

<i>Rana aurora draytonii</i>	California red-legged frog	Threatened
REPTILES		
<i>Gambelia (=Crotaphytus) sila</i>	Blunt-nosed leopard lizard	Endangered
<i>Thamnophis gigas</i>	Giant garter snake	Threatened
MAMMALS		
<i>Dipodomys nitratooides exilis</i>	Fresno kangaroo rat	Endangered
<i>Vulpes macrotis mutica</i>	San Joaquin kit fox	Endangered
BIRDS₂		
<i>Charadrius alexandrinus nivosus</i>	Western snowy plover	Threatened (Kern County)
<i>Coccyzus americanus occidentalis</i>	Western yellow-billed cuckoo	Candidate (Kern County)
<i>Empidonax traillii extimus</i>	Southwestern willow flycatcher	Endangered (Kern County) (critical habitat)
<i>Gymnogyps californianus</i>	California condor	Endangered (Kern & Tulare counties) (critical habitat)
<i>Vireo bellii pusillus</i>	Least Bell's vireo	Endangered (Kern County)
PLANTS		
<i>Monolopia congdonii (=Lembertia congdonii)</i>	San Joaquin woolly-threads	Endangered

Although there are several species identified in the list, only those species that could potentially occur in the action area (proposed construction areas) are analyzed in detail. The giant garter snake (GGS) (*Thamnophis gigas*) is the only species with potential habitat in the action area which may be impacted by the Proposed Action.

Sensitive Plants

Major representative plant communities and habitat types present include seasonally flooded freshwater emergent wetland and alkali sink scrub. CNDDDB records and USFWS species list for Merced County indicate the following rare, threatened, or endangered plant species have been sighted on or near the area in recent times:

Hispids' bird's-beak
(State- and Federally-listed endangered)
Owl's clover
(Endangered)

Cordylanthus mollis hispids

Calstilleja campestris ssp. Succlenta

Hoover's spurge
(Threatened)

Chamaesyce hooveri

Colusa grass

Neostapfia coulusana

(Threatened)

San Joaquin Valley Orcutt grass
(Threatened)

Orcuttia inaequalis

Hairy Orcutt grass
(Endangered)

Orcuttia pilosa

Greene's tuctoria
(Endangered)

Greene's tuctoria (=Orcutt grass)

Suitable habitat does not exist within the Proposed Action area for any sensitive plant species.

Giant Garter Snake

The giant garter snake inhabits wetland habitats and vegetated permanent water channels in scattered subpopulations in the Central Valley from Butte County in the north to Fresno County in the south. It is believed extirpated from the vicinity of Buena Vista and Tulare Lakes south of Fresno County. Giant garter snakes are present within the VWA.

Giant garter snakes are always found in close proximity to permanent or semi-permanent water with vegetated perimeters. The giant garter snake is an aquatic feeder specializing in capturing small fish and frogs in or under water. The giant garter snake spends the winter in upland retreats above the high water level.

The project, as planned, would have may potentially impact this species and its habitat. It is expected that achievement of project goals through implementation of stated objectives would result in a net increase of usable habitat for the species.

Measures to Avoid or Minimize Impacts

1. Operation and maintenance activities conducted within or near habitat suitable for giant garter snakes should be conducted between May 1 and October 1, during the snakes' active period.
2. Cleaning of ditches and canals should be done from one side of the canal only. This would ensure the maintenance of suitable escape cover for any snakes in the area.
3. Canals in which construction or maintenance activities are planned should be dewatered at least 15 days prior to construction.
4. Rip rap installed around water control structures and erodible ditch banks should be placed in a manner which would provide escape cover for snakes. A base of river rock should be placed on the levee for levee protection and covered with large pieces of concrete rubble to provide the escape cover.

Aleutian Canada Goose, Bald Eagle, Peregrine Falcon, and Yellow-Billed Cuckoo

The Aleutian Canada goose, Bald Eagle, Peregrine Falcon, and Yellow-Billed Cuckoo are occasional visitors to the project area. The proposed action would have no adverse impact upon or jeopardize the continued existence of these species. The project would provide additional loafing, foraging, and roosting sites within the VWA and GRCD for Aleutian Canada Geese, Bald Eagles, and Peregrine Falcons. Future tasks within the VWA would focus on improvement of foraging habitat for these species. Continued growth and expansion of riparian habitat within VWA would improve habitat conditions for the Yellow-billed Cuckoo.

Swainson's Hawk

This species is the most migratory of all North American buteos. It breeds and summers in the arid and semiarid regions of western North America and winters on the pampas of Argentina. The breeding population in California has declined by an estimated 90 percent. In 1979, the breeding population in California was estimated at 375 pairs. This species arrives in the vicinity of the North Grasslands Wildlife Area and Los Banos Wildlife Area in late February to early March each year. It nests within an intermix of trees. Trees commonly used for nesting in this area are cottonwoods, willows, and valley oaks. The principal foods in the Central Valley are meadow mice and small birds. Use of the area by Swainson's hawk coincides with the time of year when most of the seasonal wetlands have been allowed to dry for their annual growing season. Likewise, this species migrates south prior to the seasonal wetlands being flooded for wintering wildlife populations arriving in the fall.

Based upon CNDDDB records and observations by CDFG staff, no known Swainson's hawk nest sites occur within the VWA Comprehensive Management Plan project area. Nest sites do occur along the San Joaquin River, which is not located in the Proposed Action area. Swainson's hawks are featured species in the VWA management plan and would benefit from proposed projects. Grassland foraging areas and potential nest trees would be protected and maintained. The proposed project would not effect this species in this region of its range.

San Joaquin Kit Fox

The San Joaquin kit fox, a State-listed threatened and Federally-listed endangered species, is a small nocturnal canid which now occurs in scattered populations from Contra Costa County south to Kern County. Historically, this species occupied extensive areas of semiarid lands in the San Joaquin Valley. Flat topography in valley bottoms with valley sink scrub, valley saltbush scrub, interior coast range saltbush scrub, nonnative grassland and alkali playa plain communities (described in Holland, 1986) are the typical habitat, but substantial populations have always inhabited the surrounding low foothills where slopes do not exceed 40 degrees (O'farrell 1983). Agricultural, industrial, and urban developments have caused rapidly increasing rates of habitat loss.

The San Joaquin kit fox is an obligate year-round burrow dweller which feeds largely upon lagomorphs and kangaroo rats (but would utilize whatever prey is locally abundant). Numerous dens are excavated and inhabited in the course of a year and individuals may cover great distances while foraging and/or dispersing.

The San Joaquin kit fox is considered here because of the potential foraging habitat (irrigated pasture and seasonally flooded grassland and alkali sink scrub). No known active or potential kit fox dens have been observed within the project area.

3.6.2 Environmental Consequences

No Action

Under the No Action alternative, conditions would remain the same as existing conditions. There would be no new impacts to wildlife, including threatened and endangered species, their critical habitat, or general habitat types.

Proposed Action

The installation of test holes, production wells and the subsequent pumping and conveyance of groundwater would not affect aquatic species and/or their habitat. Habitat for Delta smelt, Chinook salmon (spring and winter run), central valley steelhead, or green sturgeon would not be affected because no construction or flow modifications are proposed on natural waterways. All construction would tie into existing conveyance facilities (i.e. Volta Wasteway, GRCD ditches). The conveyance facilities to be used in the proposed action are not managed for fisheries. There would be no effect to federally listed fish species mentioned above and there would be no modification of critical habitat for the species as a result of the proposed action.

A biological assessment (BA) has been prepared under Section 7(a)(2) of the Endangered Species Act (ESA) for effects to the GGS (Appendix C). Reclamation has determined that the proposed action *may affect, is likely to adversely affect GGS*.

Direct impacts may occur as a result of construction. Placement of the two wells would be limited in extent to only the immediate vicinity of the Wasteway. Total disturbance to the action area would include temporarily increased truck and worker foot traffic in what is currently a highly-frequented area as a result of well placement. Some vegetation would be removed along the north and south embankments of the Wasteway for placement of erosion control structures (approximately 4 feet by 20 feet) and could potentially affect GGS if in the area as this is potential GGS habitat.

Indirect impacts may occur if water quality has an impact on the prey base of GGS. Groundwater from the production wells placed on either side of the Wasteway would be pumped into the Wasteway and delivered downstream throughout the VWA and to GRCD. Water quality would be continually tested during the three-year pilot project at the outflow of the production wells, at monitoring well sites, and immediately upstream and downstream of the proposed well locations. If water quality is determined to be of unsuitable quality, pumping into the Wasteway would cease. Temporary or permanent impacts to water quality are not anticipated as the quality would be continuously tested and mitigation would occur as defined in the Surface Water Quality Degradation Avoidance Protocol included in the Project Monitoring Plan (Appendix B). In addition, Reclamation has included extra avoidance protocol for potential impacts to the GGS in the BA (Appendix C). Groundwater would be diluted with surface water if necessary. Pumping would cease if water quality is compromised or, if there is not enough surface water to dilute the groundwater to a suitable level for refuge management.

Overall, the Proposed Action would provide a benefit to waterfowl, shorebirds, and raptors, as the water would be used for refuge management to sustain wetland habitats.

The proposed action may benefit GGS in that it would provide water during the snake's active period (spring and summer). Restrictions during well placements and avoidance and minimization measures would help to reduce the potential for take of GGS.

During construction, avoidance and minimization measures would be followed to ensure minimal impacts to GGS. The measures include:

1. Avoid construction activities within the banks of potential GGS aquatic habitat. Confine movement of heavy equipment to existing roadways to minimize habitat disturbance.
2. Construction activity within known habitat areas should be conducted between May 1 and October 1. This is the active period for GGS and direct mortality is lessened because snakes are expected to actively move and avoid danger. Between October 2 and April 30 contact the Service's Sacramento Fish and Wildlife Office to determine if additional measures are necessary to minimize and avoid take.
3. Confine clearing to the minimal area necessary to facilitate construction activities. Flag and designate avoided GGS habitat within or adjacent to the project area as Environmentally Sensitive Areas. These areas should be avoided by all construction personnel.
4. Construction personnel would receive Service-approved worker environmental awareness training. This training instructs workers to recognize GGS and their habitat(s).
5. The project area should be surveyed for GGS by a Fish and Wildlife Service approved biologist 24-hours prior to construction activities, . The survey of the project area would be repeated if a lapse in construction activity of two weeks or great has occurred. If a snake is encountered during construction, activities shall cease until appropriate corrective measures have been completed or it has been determined that the snake would not be harmed. Report any sightings and any incidental take to the Service immediately by telephone (916) 414-6620.
6. After completion of construction activities, remove any temporary fill and construction debris and, wherever feasible, restore disturbed areas to pre-project conditions.

Cumulative Impacts

Implementation of the Proposed Action would not result in cumulative effects to biological resources. Although there may be potential impacts to potential GGS habitat and prey base, the impacts would not jeopardize the continued existence of the species. The Proposed Action would not contribute to cumulative impacts when added to other past, present or future foreseeable actions carried out by any other federal, state or local agency.

3.7 Indian Trust Assets

3.7.1 Affected Environment

Indian Trust Assets (ITAs) are legal interests in property held in trust by the U.S. for federally-recognized Indian tribes or individual Indians. An Indian trust has three components: (1) the trustee, (2) the beneficiary, and (3) the trust asset. ITAs can include land, minerals, federally-reserved hunting and fishing rights, federally-reserved water rights, and in-stream flows associated with trust land. Beneficiaries of the Indian trust relationship are federally-recognized Indian tribes with trust land; the U.S. is the trustee. By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the U.S. The characterization and application of the U.S. trust relationship have been defined by case law that interprets Congressional acts, executive orders, and historic treaty provisions.

Consistent with President William J. Clinton's 1994 memorandum, "Government-to-Government Relations with Native American Tribal Governments," Bureau of Reclamation (Reclamation) assesses the effect of its programs on tribal trust resources and federally-recognized tribal governments. Reclamation is tasked to actively engage federally-recognized tribal governments and consult with such tribes on government-to-government level (59 Federal Register 1994) when its actions affect ITAs. The U.S. Department of the Interior (DOI) Departmental Manual Part 512.2 ascribes the responsibility for ensuring protection of ITAs to the heads of bureaus and offices (DOI 1995). DOI is required to "protect and preserve Indian trust assets from loss, damage, unlawful alienation, waste, and depletion" (DOI 2000). Reclamation is responsible for assessing whether the Proposed Action has the potential to impact ITAs.

It is the general policy of the DOI to perform its activities and programs in such a way as to protect ITAs and avoid adverse effects whenever possible. The proposed action would be implemented to ensure compliance with this policy. In addition, Reclamation would comply with the procedures contained in Departmental Manual Part 512.2, guidelines, which protect ITAs.

3.7.2 Environmental Consequences

No Action

Under the No Action alternative, there are no impacts to ITAs, as no new facilities would be constructed and existing operations would continue to operate as have historically occurred.

Proposed Action

There are no tribes possessing legal property interests held in trust by the United States in the water involved with this Proposed Action, nor is there such a property interest in the lands designated to receive the water proposed in this action. The nearest ITA is the Chicken Ranch Rancheria approximately 62 miles northeast of the Proposed Action location. There would be no impacts to ITAs as a result of Proposed Action.

Cumulative Impacts

Because there are no impacts to ITAs as a result of the Proposed Action, the Proposed Action would not contribute to any cumulative impacts to ITAs.

3.8 Environmental Justice

3.8.1 Affected Environment

As mandated by Executive Order 12898 (E.O. 12898), published February 11, 1994, entitled, “Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations”, this EA addresses potential environmental justice concerns. The population of some small communities in the Central Valley typically increases during late summer harvest. The market for seasonal workers on local farms draws significant numbers of migrant workers, commonly of Hispanic origin from Mexico and Central America.

3.8.2 Environmental Consequences

No Action

The No Action Alternative would have no impact on environmental justice. VWA and SLDMWA would continue to manage their water supplies to meet the needs. Conditions would be the same as the existing conditions; therefore, no additional impacts are associated with this alternative.

Proposed Action

The Proposed Action involves a temporary construction to install groundwater production wells and the subsequent pumping of those wells to diversify refuge water supply within the VWA. The Proposed Action would not cause dislocation, changes in employment, or increase flood, drought, or disease. The Proposed Action would not disproportionately impact economically disadvantaged or minority populations. No impacts relevant to Environmental Justice are anticipated because the project does not result in any change in operations that would affect the general public.

Cumulative Impacts

Because the Proposed Action would have no impact on minority or disadvantaged populations, the Proposed Action would not contribute to cumulative impacts on those populations.

3.9 Cultural Resources

3.9.1 Affected Environment

This section discusses the identification of cultural resources and the potential for well installation to affect historic properties.

Regulatory Setting

A cultural resource is a broad term that includes prehistoric, historic, architectural, and traditional cultural properties. The National Historic Preservation Act (NHPA) of 1966, as amended (16 USC 470 *et. seq.*), is the primary Federal legislation that outlines the Federal Government's responsibility to cultural resources. Section 106 of the NHPA requires the Federal Government to take into consideration the effects of an undertaking on cultural resources listed on or eligible for inclusion in the National Register of Historic Places (NRHP). Those resources that are on, or eligible for inclusion on, the NRHP are referred to as historic properties. The criteria for NRHP eligibility are located at 36 CFR Part 60.

The Section 106 process is outlined in the Federal regulations at 36 CFR Part 800. These regulations describe the process that the Federal agency (Reclamation) takes to identify cultural resources and the level of effect that the proposed undertaking will have on historic properties. In summary, Reclamation must first determine if the action is the type of action that has the potential to affect historic properties. If the action is the type of action to affect historic properties, Reclamation must identify the area of potential effects (APE), determine if historic properties are present within that APE, determine the effect that the undertaking will have on historic properties, and consult with the State Historic Preservation Office (SHPO), to seek concurrence on Reclamation's findings. In addition, Reclamation is required through the Section 106 process to consult with Indian Tribes concerning the identification of sites of religious or cultural significance, and consult with individuals or groups who are entitled to be consulting parties or have requested to be consulting parties.

Cultural Resource Identification

In an effort to identify historic properties, Reclamation reviewed its archaeological site index and project data. The only cultural resource located within the project area is the Volta Wasteway (Wasteway), which is part of the Delta-Mendota Canal (DMC). The DMC was completed in 1951 as part of the Delta Division of the Central Valley Project (CVP) to convey water from the Tracy (C.W. "Bill" Jones) Pumping Plant along the west side of the San Joaquin Valley. Water in the DMC is used in the San Luis Unit, the Friant-Kern and Madera systems, and replaces San Joaquin River water stored at Friant Dam. The DMC is approximately 117 miles long and is about 16 feet deep with a bottom width of 100 feet. The canal terminates at the Mendota Pool about 30 miles west of Fresno. The first 95 miles of the DMC are concrete lined, while the remaining 22 miles are unlined.

Reclamation is in the process of nominating the Central Valley Project (CVP) to the National Register of Historic Places (National Register). As part of the CVP, the DMC has been found eligible for inclusion in the National Register under Criterion A for its association with irrigation and agricultural development of California. The Wasteway is a contributing feature to the DMC and has been determined eligible for the National Register under Criterion A for its contribution to the broad patterns of history.

The proposed construction of two production wells and two series of monitoring wells will not affect the function or design of the Wasteway, will not affect its ability to deliver water, and would not affect the qualities that make the Wasteway eligible for listing on the NRHP under Criterion A. All work will be confined to already disturbed and constructed areas within the canal prism and adjacent canal berms; therefore, there is no potential for intact archaeological

deposits within the canal bed or along the berms. The proposed well installation will result in no adverse affect on historic properties pursuant to 36 CFR Part 800.5(b). This determination is pending SHPO concurrence.

Table 6 Location of Test-Production Wells

	Location	Quadrangle	Facility
Well 1	NW¼NW¼ Sec. 18, T. 22 N., R. 2 W.	Volta	Volta Wasteway
Well 2	NW¼NW¼ Sec. 29, T. 22 N., R. 2 W.	Volta	Volta Wasteway

3.9.2 Environmental Consequence

No Action

Under the No Action Alternative, there are no impacts to cultural resources since there would be no change in operations and no ground disturbance. Conditions related to cultural resources would remain the same as existing conditions.

Proposed Action

The Proposed Action is the type of activity that has the potential to affect historic properties. The only historic property identified within the project area was the Wasteway. The proposed well installation would result in no adverse affect to historic properties pursuant to 36 CFR Part 800.5(b). Since no historic properties will be affected, no cultural resources will be impacted as a result of implementing the proposed action.

Cumulative Impacts

Under the Proposed Action, no historic properties would be impacted; therefore, cultural resources would not be impacted. Since there are no impacts to cultural resources, the Proposed Action would not contribute to cumulative impacts on cultural resources.

3.10 Climate Change

3.10.1 Affected environment

The United Nations Intergovernmental Panel on Climate Change predicts that changes in the earth's climate would continue through the 21st century and that the rate of change may increase significantly in the future because of human activity (IPCC, 2001). Many researchers studying California's climate believe that changes in the earth's climate have already affected California and would continue to do so in the future. Climate change may seriously affect the State's water resources. Temperature increases could affect water demand and aquatic ecosystems. Changes in the timing and amount of precipitation and runoff could occur. Sea level rise could adversely affect the Sacramento-San Joaquin River Delta and coastal areas of the State.

Climate change is identified in the 2005 update of the California Water Plan (Bulletin 160-05) as a key consideration in planning for the State's future water management (DWR, 2005). The 2005 Water Plan update qualitatively describes the effects that climate change may have on the State's water supply. It also describes efforts that should be taken to quantitatively evaluate climate change effects for the next Water Plan update.

Sea level rise would conceptually affect water project operations by increasing the need for operations to repulse salt water intruding into the Delta. Such effects were not examined during preparation of the DWR report due to lack of existing tools for that type of analysis (current Work Team activities involve collaborations to develop these necessary tools). The report does discuss surrogates that provide indication of increased operation challenges associated with repulsing saltwater intrusion caused by sea level rise.

3.10.2 Environmental consequences

No Action

Under the No Action Alternative, there would be no impacts to climate change.

Proposed Action

Under the Proposed Action, the small construction element would not contribute to increased temperatures or sea level rise. The use of the Volta Wasteway is within the range of normal operations would have no impact on climate change.

Cumulative Impacts

Since there are no impacts to climate changes as a result of the Proposed Action, the Proposed Action would not contribute cumulative impacts to climate change.

Section 4 Consultation and Coordination

During preparation of this environmental assessment, the following agencies were coordinated with and/or assisted in preparing the document:

- U.S. Fish and Wildlife Service (Service)
- California Department of Fish and Game
- Grassland Water District
- San Luis Delta Mendota Water Authority
- State of California Historic Preservation Office (SHPO)

On October 27, 2009 Reclamation initiated formal consultation under Section 7 of the Endangered Species Act (ESA) with the United States Fish and Wildlife Service (USFWS). A non-jeopardy biological opinion is anticipated from the consultation. ESA consultation would be completed prior to finalization of this EA and FONSI (Appendix C).

Reclamation has consulted with USFWS on the applicability of the Fish and Wildlife Coordination Act. A Coordination Act Report will be prepared and included in the Final EA. Reclamation consulted with SHPO pursuant to Section 106 of the National Historic Preservation Act on January 22, 2010. Reclamation received a letter from SHPO on February 11, 2010 concurring with Reclamation's findings.

Section 5 List of Preparers and Reviewers

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